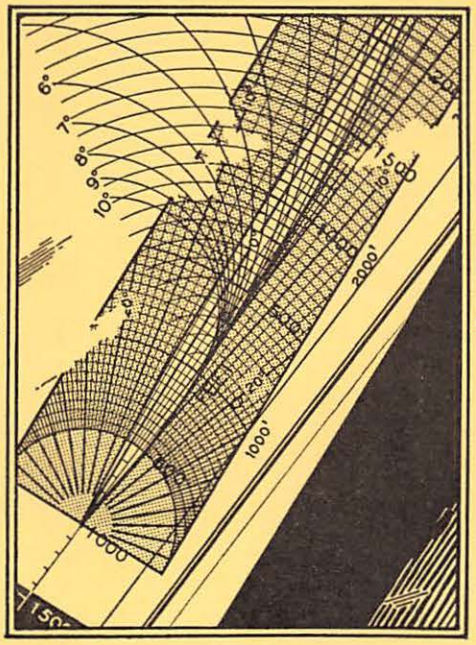


SEARCHLIGHT SIGNALS

ENGINEERING DATA

for determining

Beam Spread and Range—Proper Use of Various Deflecting Cover Glasses—Proper Location of Signals on Curves—Correct Voltage for Lamp Operation,

Including the use of the
ORIENTING GRAPH

U. D. 200

Revised August, 1942

Union Switch & Signal Co.
SWISSVALE, PA.

Union Switch & Signal Company

SWISSVALE, PA.

Subject: Engineering Data on Searchlight Signals, for determination of:

(a) Beam Spread and Range
(b) Type of Deflecting Cover Glass
(c) Proper Location of Signals on Curves
(d) Correct Voltage for Lamp Operation

Union Development

Number 200

Date Rewritten August 12, 1942

22 Sheets

Purpose:

This "Union Development" provides engineering data which makes it possible to anticipate results which can be obtained from the Union Style "H", "H-2" and "H-5" Light Signals. With the data given herein and a track plan showing track curvature, it is possible to predetermine the range that can be obtained for any known track layout.

It is, of course, not always possible to locate signals on tangent track, and when they are located on curves, it is often necessary to use special deflecting cover glasses to increase the horizontal spread of the beam in order that an indication may be obtained around the curve. Horizontal "Range-Spread" Curves for signals employing varying combinations of lamps and deflecting cover glasses are shown herein. By using an Orienting Graph in conjunction with these curves, the range of these signals equipped with any of the given lamps or cover glasses can be foretold. In this manner it is possible to determine the optical arrangement that will give the best results for any given track condition. Information is also provided showing the effect on the range of the signal by varying the lamp voltage.

Practical application of the information made available will assist those responsible for the planning of signaling systems

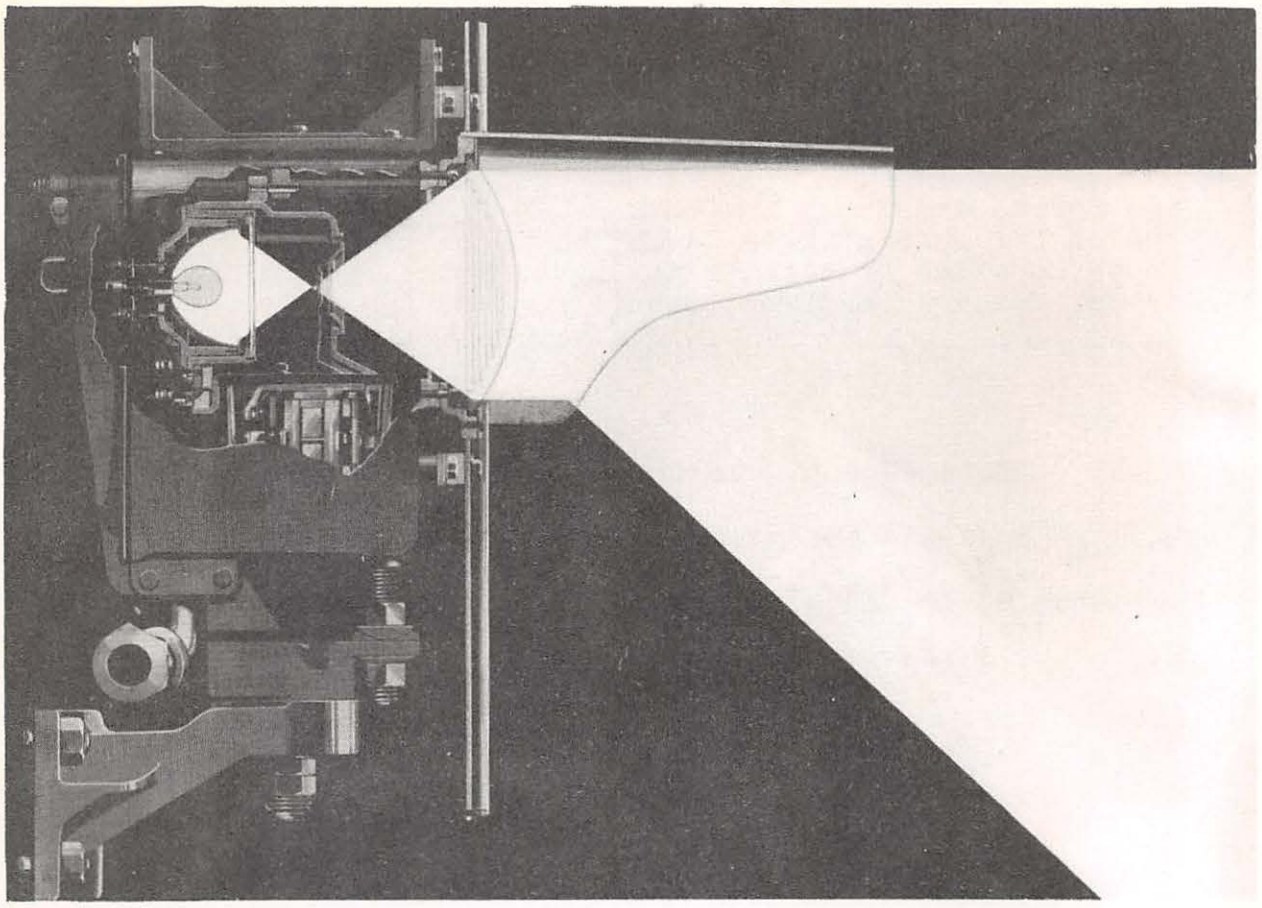


Fig. 1....Style "H" Signal showing Optical Combination, without Deflecting Cover Glass. The lower beam spread is from the "close-up" deflecting prisms in the center of the Lens.

employing Union Searchlight Signals to anticipate within reasonable limits the expected performance and to ascertain the proper "Optical Combination" for different track alignments. Preliminary negotiations and resultant delays are thus reduced to a minimum.

Information presented herein should also be of assistance to those having installations of this type of signal, especially in those cases where previous lack of information regarding the particulars of location and track alignment has resulted in an inefficient optical system being installed. With

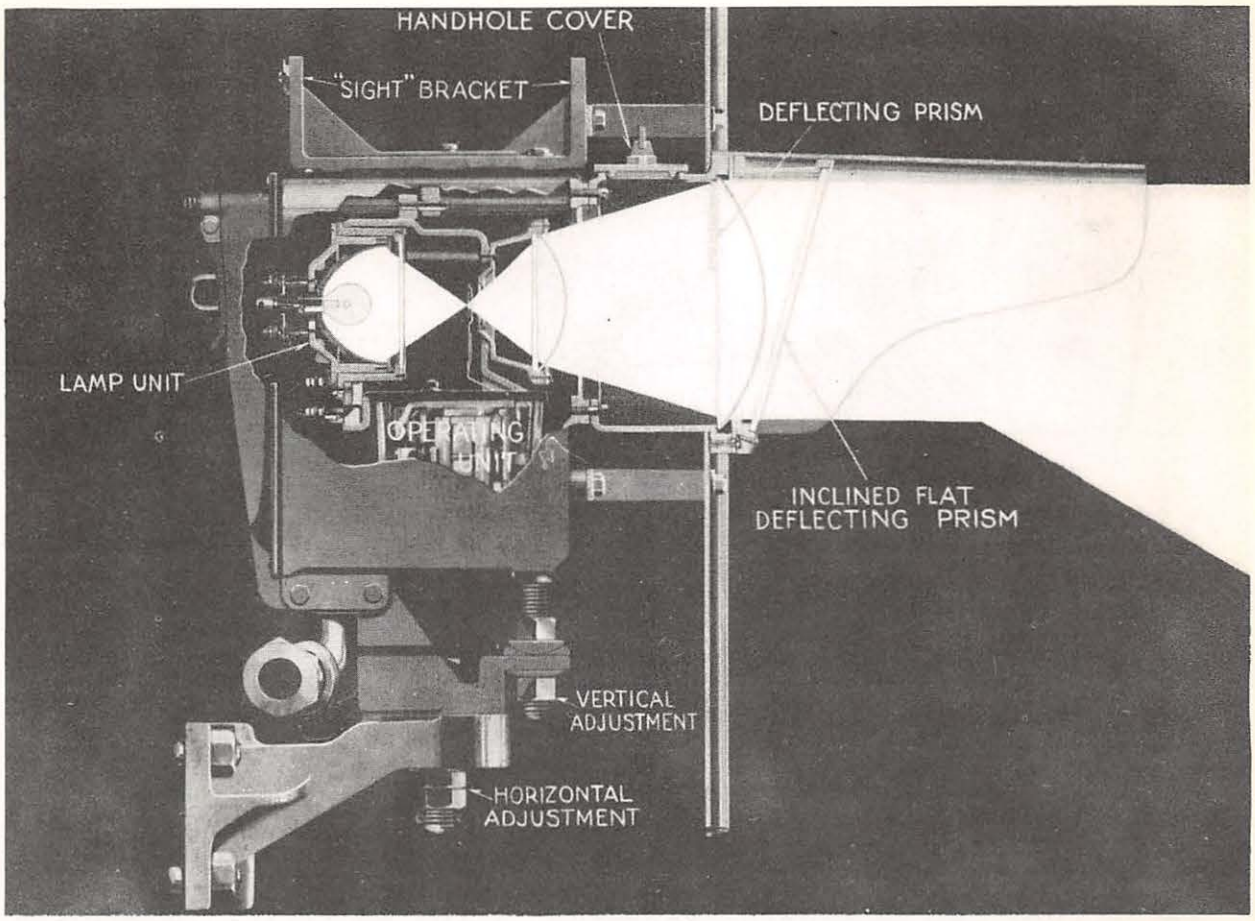


Fig. 2....Style "H-2" Signal showing Optical Combination, with Deflecting Cover Glass. The lower beam spread is from the "close-up" deflecting prism mounted at the top of and behind the front ground lens. (Style "H-5" Signal optical combination is the same as the "H-2" except for mechanical assembly.)

information now available, it may be possible to improve ranges of existing indications and also in some cases to obtain sufficient range with lower lamp voltage, thus increasing the lamp life.

General Information:

Union Style "H" and "H-2" Signals have been described in U. D. #151, Instruction Pamphlet U-5034, and Service Specification #2377. Union Style "H-5" Signals have been described in U. D. #237, Instruction Pamphlet U-5048, and Service Specification #3079. Catalog Plates B-2865 to B-2900 provide ordering references for these signals. Functional and detail information

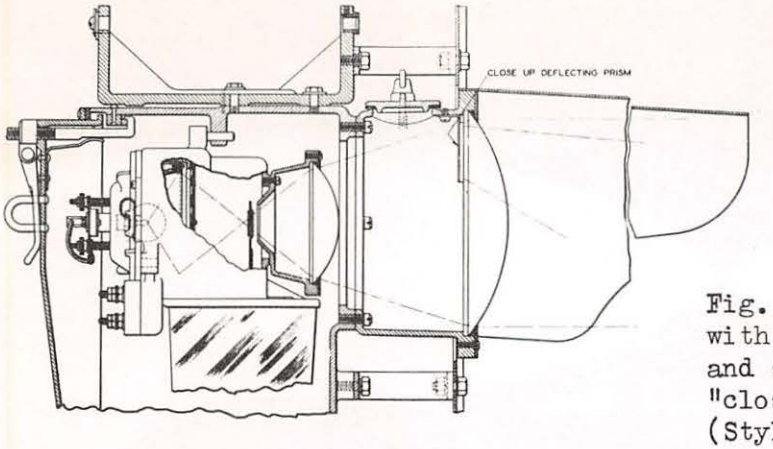


Fig. 3.....Style "H-2" Signal with no Deflecting Cover Glass and showing application of "close-up" deflecting prism. (Style "H-5" is similar)

is provided herein for only those parts or features having particular reference to the "Optical Combination".

Optical Combination (See Figs. 1, 2 and 3)

Style "H" Type:

The light beam of the Style "H" Signal is concentrated at the colored roundel location by means of an elliptical glass reflector. It is a characteristic of the elliptical reflector that, with the lamp filament located at the focal point of the reflector, the reflected light is concentrated at the other focal point of the complete ellipse, which in the operating unit is approximately the location of the colored roundel. After passing through the colored roundel, the light spreads out to cover the lens, which concentrates the light rays into a beam, having the color of the roundel. The lamp, lamp socket and reflector holder are inserted as a unit in the back of the top case and held there by spring clips. The lamp socket is adjusted and sealed at the factory and accurately based lamps may be placed in it without readjustment.

Close-Up Indication: The standard 8-3/8 in. diameter signal lens has a deflecting prism formation moulded in the center,

and on the inside of the lens. This prism, for "close-up" view of the indication, when the signal is located above the engineman's line of sight, deflects a portion of the light beam downward at an angle of approximately 40 degrees from the center line of the main light beam. The lens can be rotated, if necessary, to bring this "close-up" beam to any position that may be required by signals having different heights or located to one side of the track.

Style "H-2" and "H-5" Types:

The Styles "H-2" and "H-5" Optical Systems conform with that of the Style "H" Signal except that a special doublet combination of accurately ground lenses replaces the single 8-3/8 in. moulded lens. This combination is highly efficient. It permits the use of 5 watt lamps from primary battery at locations where alternating current is not available, and thus its installation secures Searchlight signal advantages without the cost of erecting a pole line.

In order to provide for "close-up" indication, a separate 2-5/16 in. diameter clear deflecting prism having the same characteristics as the formation moulded in the center of the standard 8-3/8 inch Style "H" Signal lens is fitted at the top and behind the outer ground lens. This prism is made accessible through the use of a small hand hole in the top of the lens housing and may be rotated to suit varying "Close-up" indication requirements.

Deflecting Cover Glasses:

Various cover glasses applicable to any of the Signals are available for spreading the signal beam in the horizontal

direction where signals are located on curves. The correct cover glass for any given condition can be determined by using the "Orienting Graph" as described below.

Orienting Graph:

The transparent "Orienting Graph" in the pocket of the back cover is a series of railroad curves of varying degrees of curvature drawn to the same scale as the range curves. This graph is extremely useful for ascertaining proper location of signals with respect to curve and tangent track, and also for determining the correct cover glass to use where a signal is on or near a curve.

When installing signals, they should always be located with tangent track ahead of the signal if possible, but local conditions are not always such that this can be done. Accordingly there are three cover glasses available giving 10 and 20 degree deflection, and 30 degree spreadlight, for use on signals located on curves. The 10 degree and 20 degree prisms deflect a portion of the beam to the right or left as desired, and the 30 degree cover glass spreads the beam 15 degrees to each side of the axis. The 10 degree cover glass is sufficient for most curves, and the 20 degree is available for the wider angle curves, but for very sharp curves where only a short range view of the signal is required, the 30 degree glass can be used. Obviously, existing obstructions on curves such as buildings, hills, cuts, etc. will obscure any signal indication. The "Range-Spread" curves for signals equipped with these three cover glasses appear on the following pages.

The "Orienting Graph" superimposed on the Range-Spread curves, Figs. 7 to 30, provides an easy method of determining what range can be obtained for any given track condition and also which cover glass will give the longest range for the given condition. It should be kept in mind that when either of the deflecting cover glasses are used, the signal which for convenience may be located at a point A should be aligned across the curve to a point B of longest range and that the cover glass should be mounted with the arrow (denoting direction of spread) pointing in the direction towards that part of the curve subtended by the chord AB. This alignment is described on Page 12 of Instruction Pamphlet U-5034 and Pages 5 and 6 of Instruction Pamphlet U-5048. The curve approaching the signal will then be covered by the beam spread produced by the cover glass, which has a decreasingly shorter range as the signal is approached. When the 30 degree spreadlight cover glass is used, the signal should be aligned approximately 15 degrees across the curve.

How to Use the Graph:

There are three conditions encountered in locating signals. First, the signal may be on tangent track preceded by a curve; second, the signal may be on a curve where the indication must be obtained entirely on the curve; and third, the signal may be on a curve preceded by tangent track.

Figs. 4, 5 and 6 illustrate the use of the "Orienting Graph" and "Range-Spread" curves for the three conditions, using in each case "Range-Spread" Curve Fig. 14, for the Style "H" Signal. The procedure will be the same when using curves for other optical combinations.

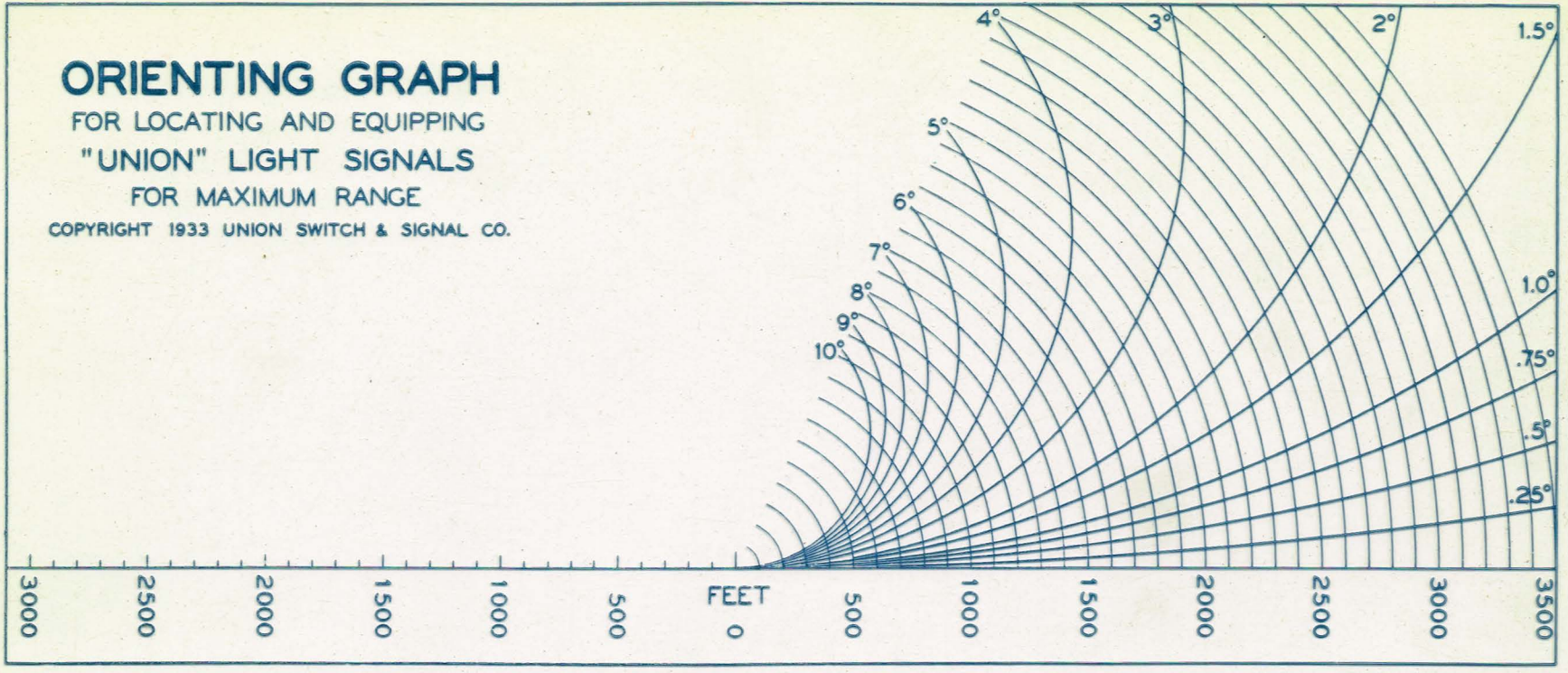
ORIENTING GRAPH

FOR LOCATING AND EQUIPPING

"UNION" LIGHT SIGNALS

FOR MAXIMUM RANGE

COPYRIGHT 1933 UNION SWITCH & SIGNAL CO.



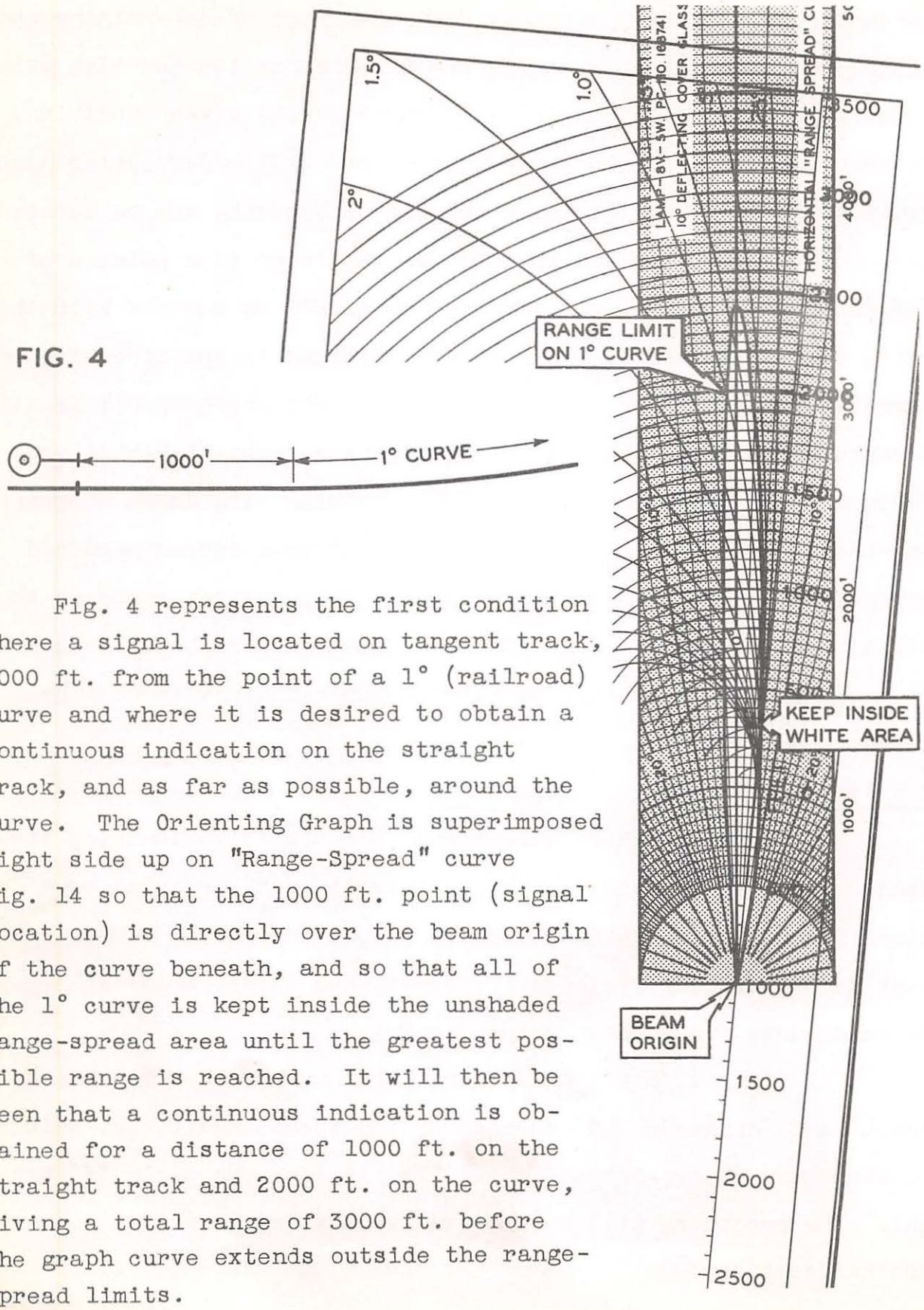


FIG. 4

Fig. 4 represents the first condition where a signal is located on tangent track, 1000 ft. from the point of a 1° (railroad) curve and where it is desired to obtain a continuous indication on the straight track, and as far as possible, around the curve. The Orienting Graph is superimposed right side up on "Range-Spread" curve Fig. 14 so that the 1000 ft. point (signal location) is directly over the beam origin of the curve beneath, and so that all of the 1° curve is kept inside the unshaded range-spread area until the greatest possible range is reached. It will then be seen that a continuous indication is obtained for a distance of 1000 ft. on the straight track and 2000 ft. on the curve, giving a total range of 3000 ft. before the graph curve extends outside the range-spread limits.

FIG. 5

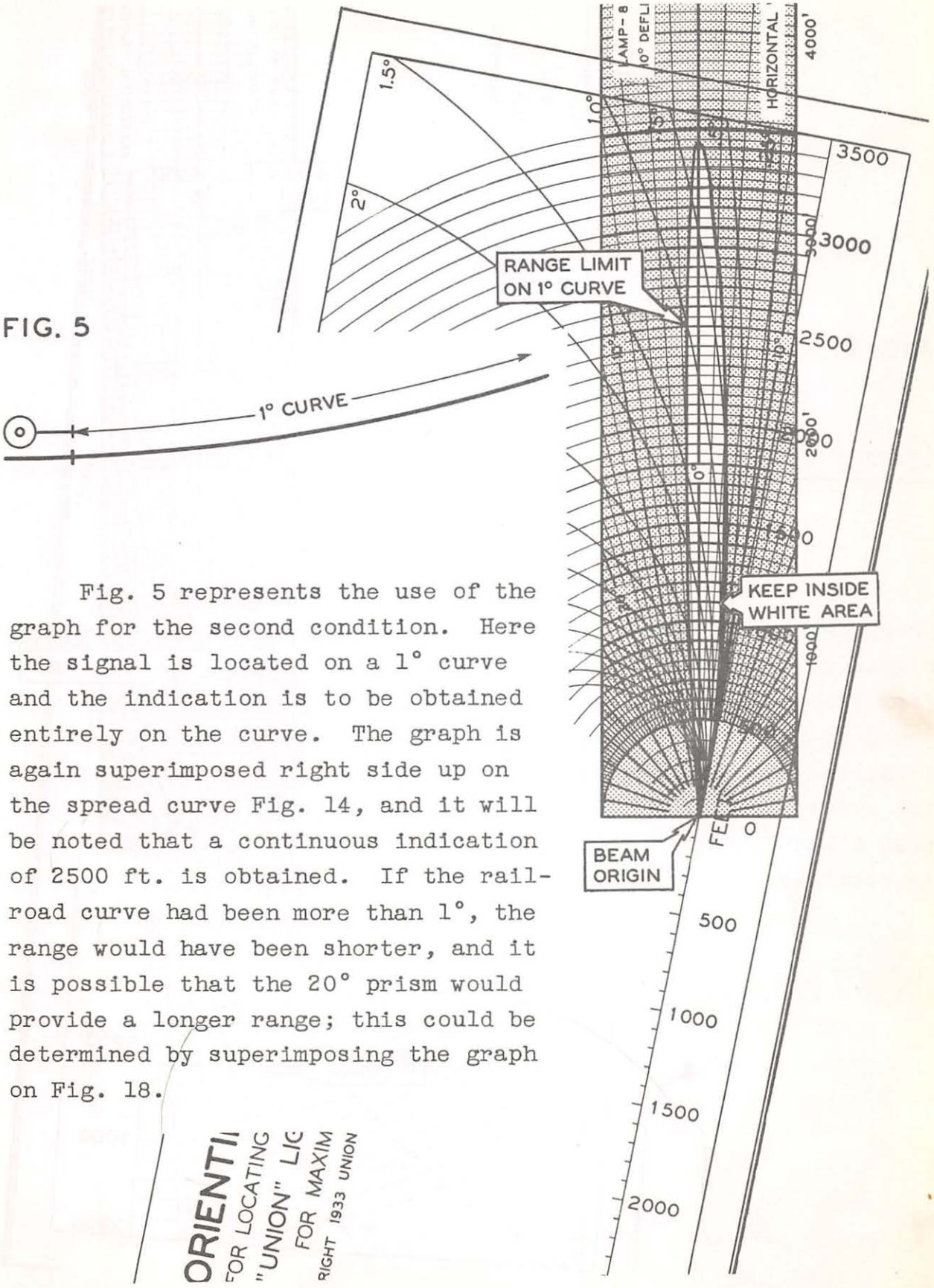


Fig. 5 represents the use of the graph for the second condition. Here the signal is located on a 1° curve and the indication is to be obtained entirely on the curve. The graph is again superimposed right side up on the spread curve Fig. 14, and it will be noted that a continuous indication of 2500 ft. is obtained. If the railroad curve had been more than 1°, the range would have been shorter, and it is possible that the 20° prism would provide a longer range; this could be determined by superimposing the graph on Fig. 18.

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FOR LOCATING
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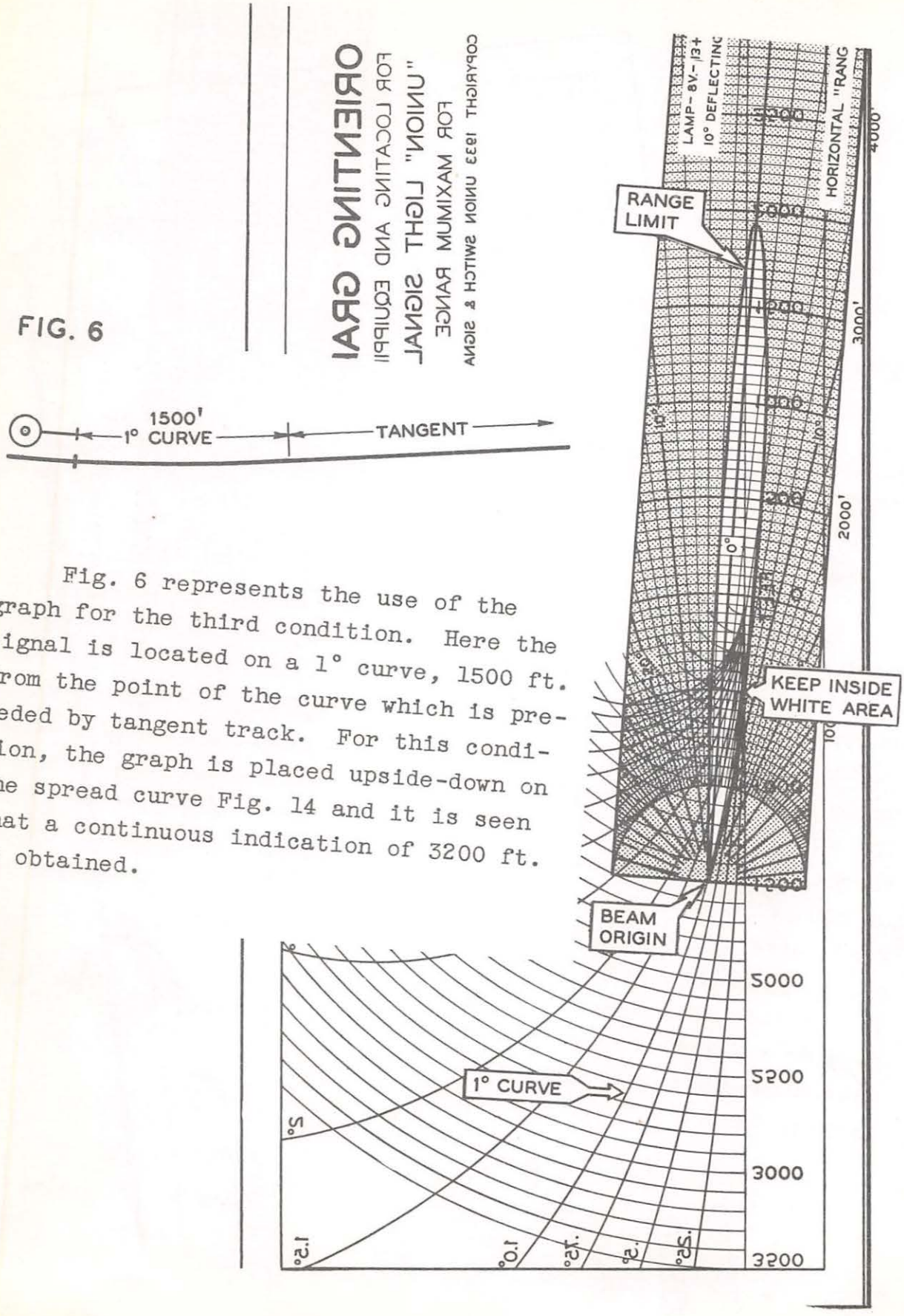


FIG. 6

Fig. 6 represents the use of the graph for the third condition. Here the signal is located on a 1° curve, 1500 ft. from the point of the curve which is preceded by tangent track. For this condition, the graph is placed upside-down on the spread curve Fig. 14 and it is seen that a continuous indication of 3200 ft. is obtained.

Horizontal "Range-Spread" Curves

In explanation of the following horizontal "Range-Spread" Curves, it is pointed out that these are arranged two on a page in which the difference is the type of lamp used. The small associated diagrams illustrate the optical combinations and the parts are consistently referenced throughout so that differences in lens assemblies may readily be detected. All ranges shown in the curves are based upon lamps being burned at our recommended voltages and if other voltages are used, corrections should be made as outlined on Page 20.

In all of the horizontal "Range-Spread" Curves where cover glasses have been used to deflect the beam, the spreads have been shown to the left facing the signal. In cases where the track curvature requires the opposite spread, it should be understood that the 10° and 20° deflecting cover glasses may be rotated 180° in the lens housings and thus as far as practical results are concerned, the "Range-Spread" curves shown are adequate.

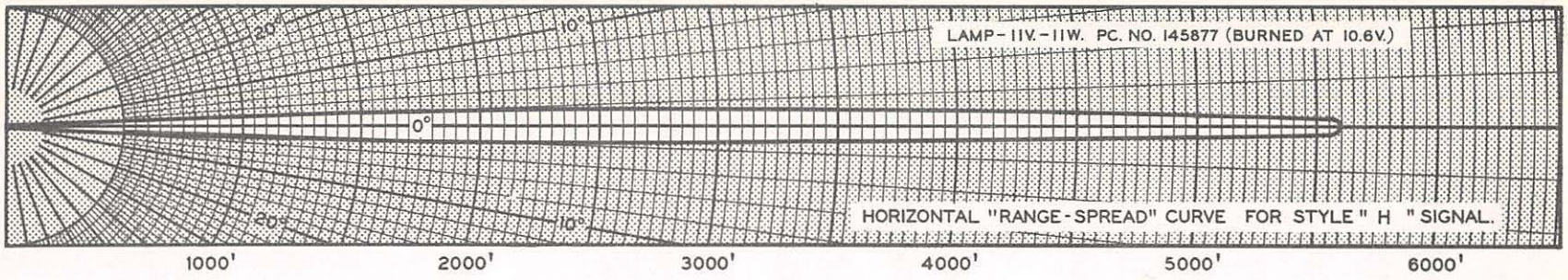


FIG. 7.

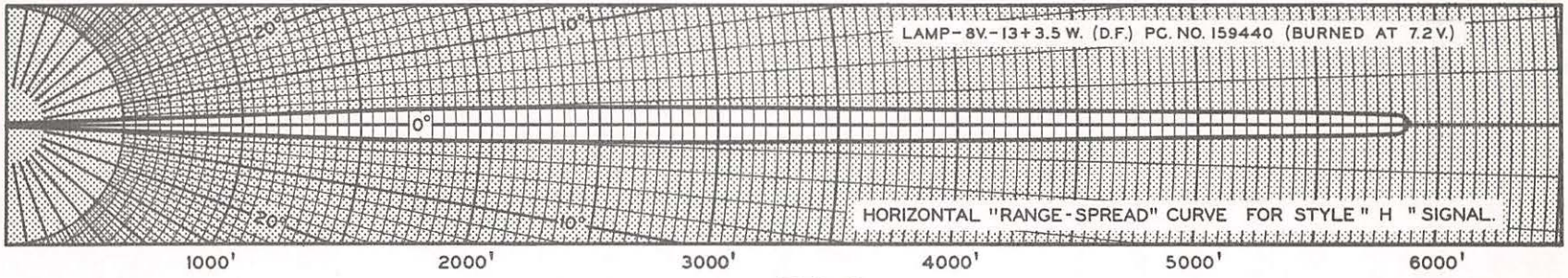


FIG. 8.

FIG. 9 STD. OPTICAL COMBINATION for STYLE "H" SIGNAL

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

C -8-3/8" LENS, Ref. 10, Pl.B-2880

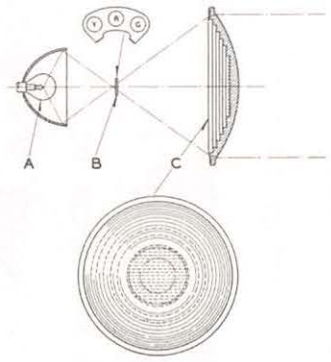


FIG. 9.

STYLE "H" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES, FIGS. 7 and 8 show results obtained when 11V.-11W. and 8V.-13+3.5W. (D.F.) Lamps are used in a Standard Style "H" Optical Combination, as in Fig. 9.

FIG. 10 STD. OPTICAL COMBINATION for STYLE "H-2" and "H-5" SIGNAL

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

D -LENS, Ref. 4, Pl.B-2888

E -2-5/16"DEF.PRISM, 36,Pl.B-2881

F -8-3/8" OUTER LENS,10,Pl.B-2881

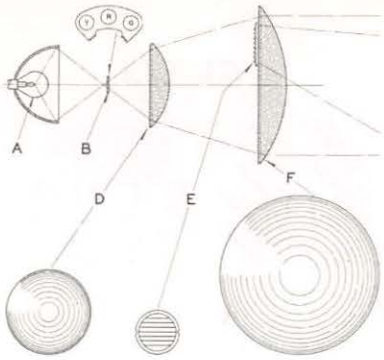


FIG. 10.

STYLE "H-2" and "H-5" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES, FIGS. 11 and 12, show results obtained when 8V.-5W. and 8V.-13+3.5W. (D.F.) Lamps are used in a Standard Optical Combination, as in Fig. 10.

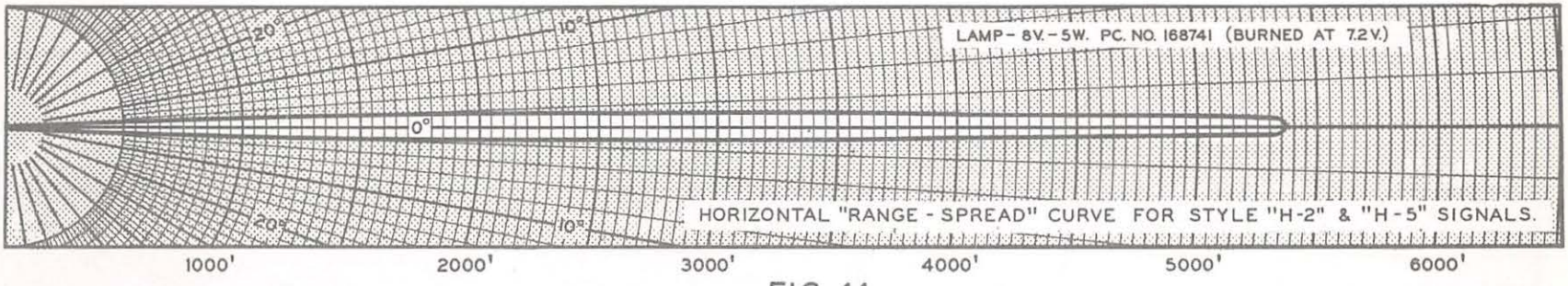


FIG. 11

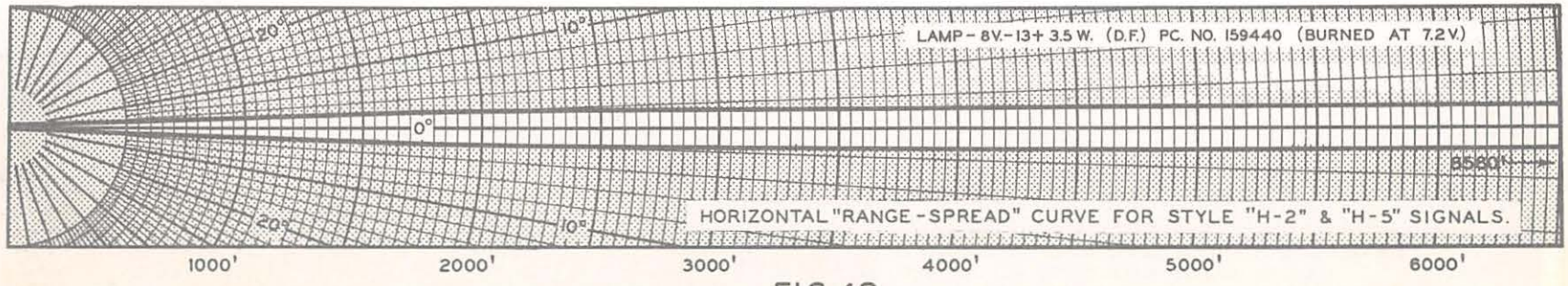


FIG. 12

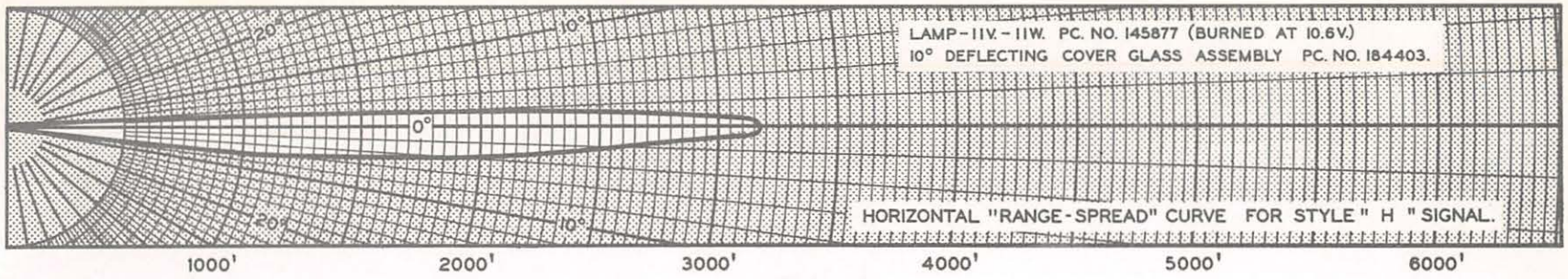


FIG. 13

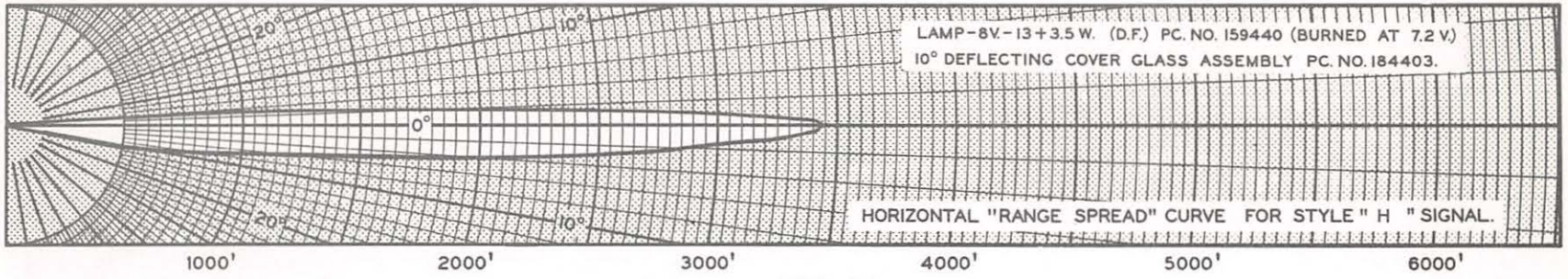


FIG. 14

FIG. 15 OPTICAL COMBINATION for STYLE "H" SIGNAL with a 10° Def.Cover Glass

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

C -8-3/8" LENS, Ref.10,Pl.B-2880

G -10° DEF.COV.GLASS,Pc.No.182864

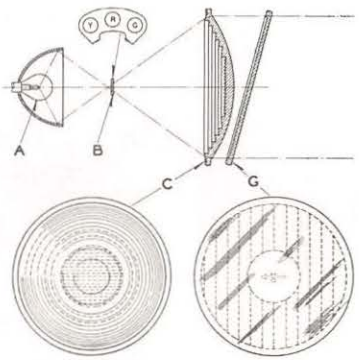


FIG. 15.

STYLE "H" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES FIGS. 13 and 14 show results obtained when 11V.-11W. and 8V.-13+3.5W. (D.F.) Lamps are used in a Style "H" Optical Combination equipped with 10° Deflecting Cover Glass, as in Fig. 15.

FIG. 16 OPTICAL COMBINATION for STYLE "H" SIGNAL with a 20° Def. Cover Glass

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

C -8-3/8" LENS, Ref.10,Pl.B-2880

Ga-20°DEF.COV.GLASS,Pc.No.182473

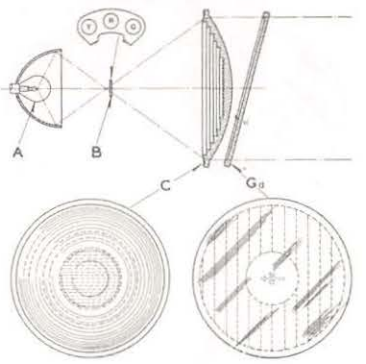


FIG. 16.

STYLE "H" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES FIGS. 17 and 18 show results obtained when 11V.-11W. and 8V.-13+3.5W. (D.F.) Lamps are used in a Style "H" Optical Combination equipped with 20° Deflecting Cover Glass, as in Fig. 16.

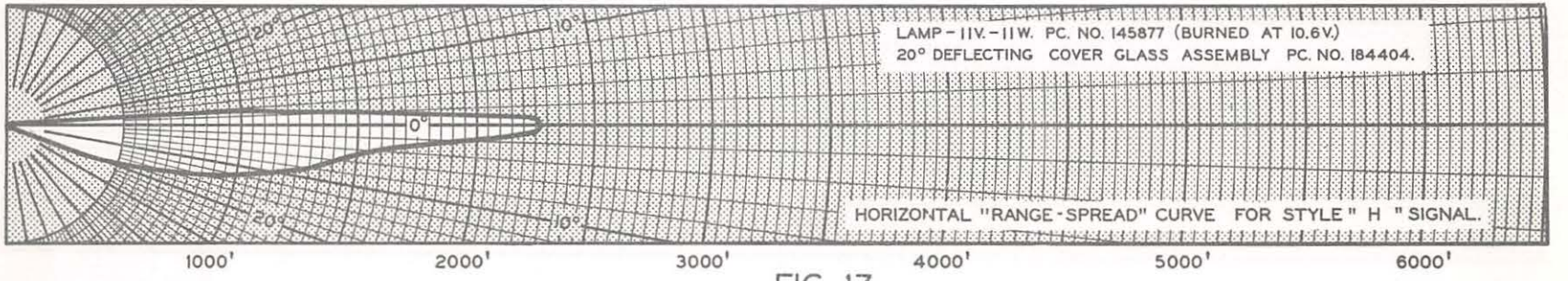


FIG. 17.

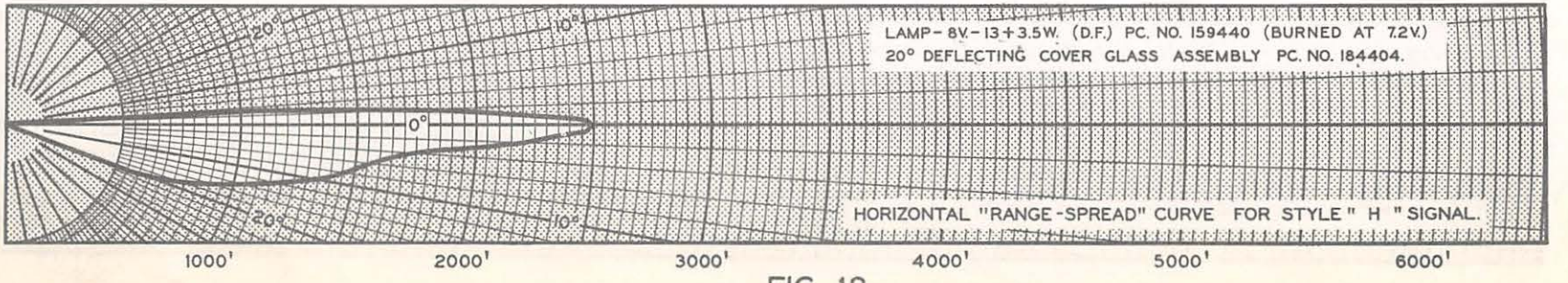


FIG. 18.

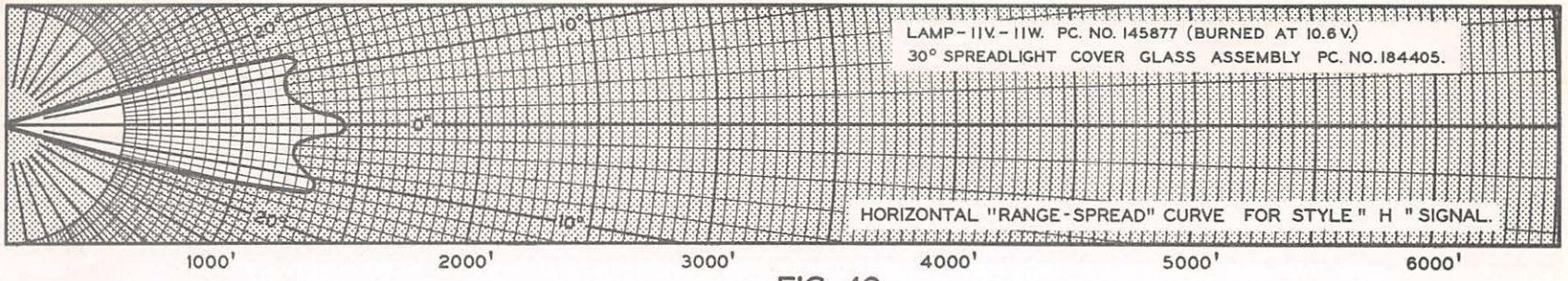


FIG. 19.

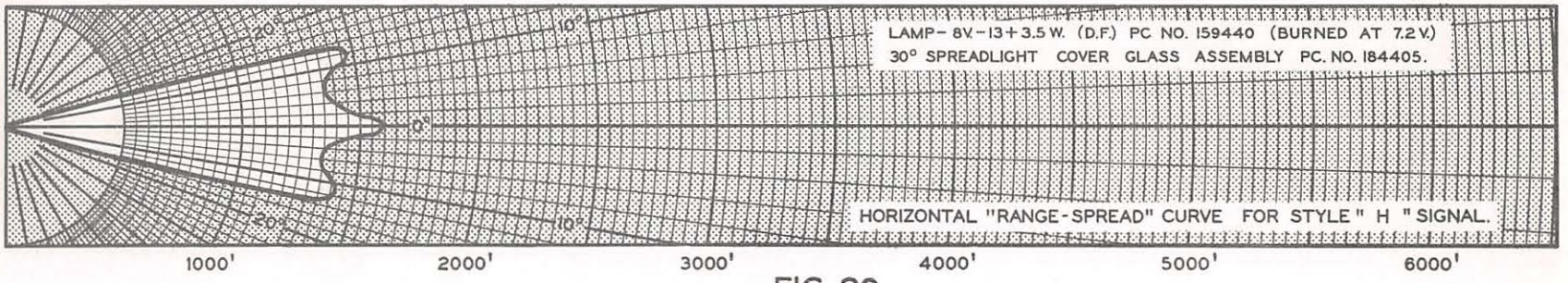


FIG. 20.

FIG. 21 OPTICAL COMBINATION for "H" SIGNAL with a 30° SPREADLIGHT COVER GLASS

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

C -8-3/8" LENS, Ref.10, Pl.B-2880

Gb-30° SPREADLIGHT, Pc.No.184406

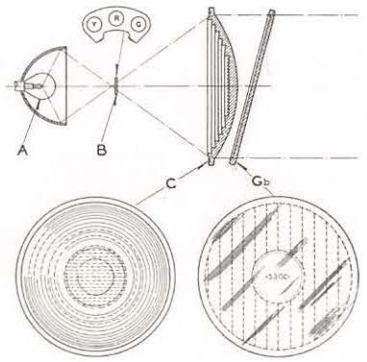


FIG. 21.

STYLE "H" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES FIGS. 19 and 20 show results obtained when 11V.-11W. and 8V.-13+3.5W. (D.F.) Lamps are used in a Style "H" Optical Combination equipped with a 30° Spreadlight Cover Glass, as in Fig. 21.

FIG. 22 OPTICAL COMBINATION for STYLE "H-2" and "H-5" SIGNAL with 10° Def. Cover Glass.

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

D -LENS, Ref. 4, Pl.B-2888

E -2-5/16"DEF.PRISM,36,Pl.B-2881

F -8-3/8"OUTER LENS,10,Pl.B-2881

G -10°DEF.COV.GLASS,Pc.No.182864

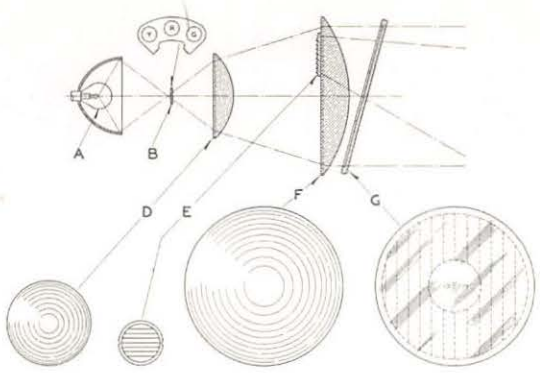


FIG. 22.

STYLE "H-2" and "H-5" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES, FIGS. 23 and 24, show results obtained when 8V.-5W. and 8V.-13+3.5W. (D.F.) Lamps are used in the Optical Combination equipped with a 10° Deflecting Cover Glass, as in Fig.22.

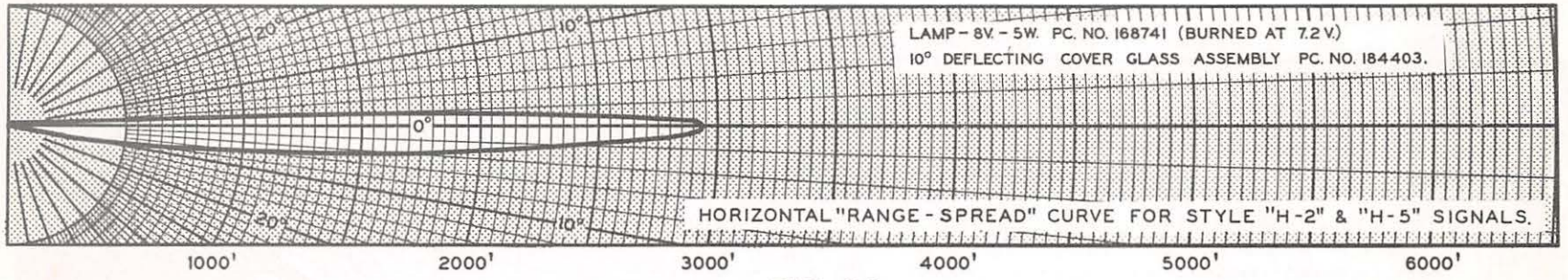


FIG. 23

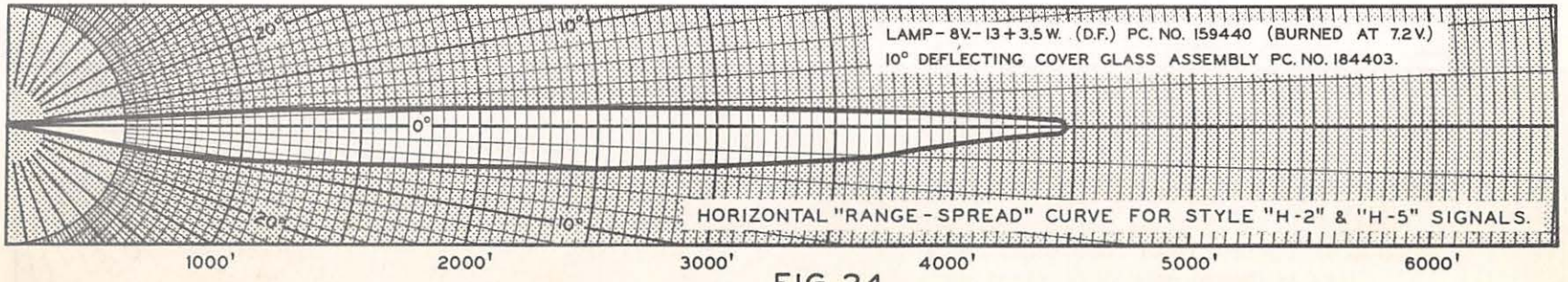


FIG. 24

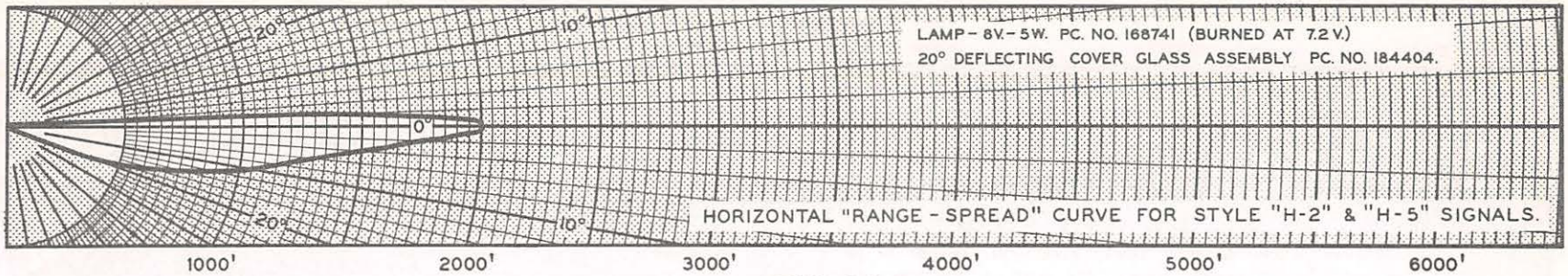


FIG. 25

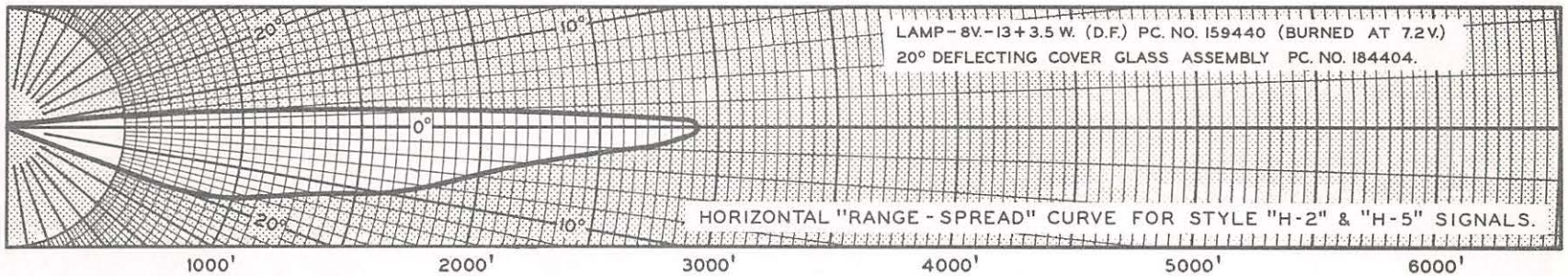


FIG. 26

FIG. 27 OPTICAL COMBINATION for STYLE "H-2" AND "H-5" SIGNAL with 20° Def. Cover Glass.

A -LAMP, as specified on Curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

D -LENS, Ref. 4, Pl.B-2888

E -2-5/16"DEF.PRISM,36,Pl.B-2881

F -8-3/8"OUTER LENS,10,Pl.B-2881

Ga-20°DEF.COV.GLASS,Pc.No.182473

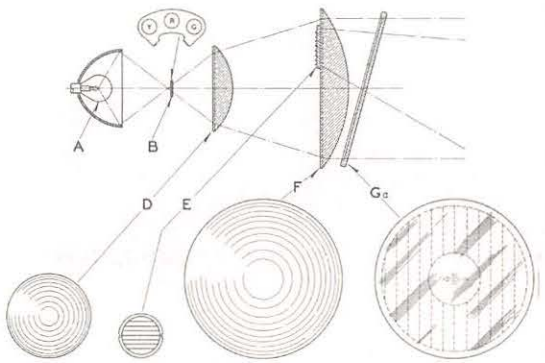


FIG. 27.

STYLE "H-2" and "H-5" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES, FIGS. 25 and 26 show results obtained when 8V.-5W. and 8V.-13+3.5W. (D.F.) Lamps are used in the Optical Combination equipped with a 20° Deflecting Cover Glass, as in Fig. 27.

FIG. 28 OPTICAL COMBINATION for "H-2" and "H-5" SIGNAL with 30° SPREADLIGHT COVER GLASS

A -LAMP, as specified on curves

B -ROUNDEL, 91 to 91d, Pl.B-2885

D -LENS, Ref. 4, Pl.B-2888

E -2-5/16"DEF.PRISM,36,Pl.B-2881

F -8-3/8" OUTER LENS,10,Pl.B-2881

Gb-30° SPREADLIGHT, Pc.No.184406

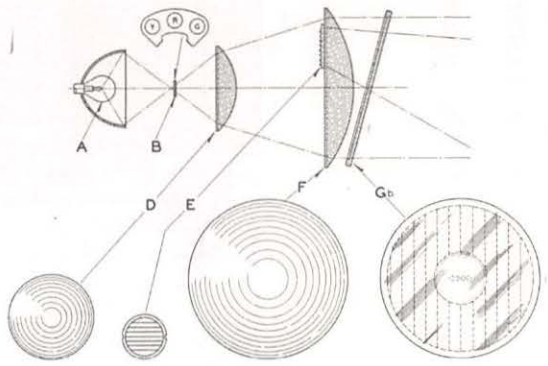


FIG. 28.

STYLE "H-2" and "H-5" SIGNAL HORIZONTAL "RANGE-SPREAD" CURVES, FIGS. 29 and 30, show results obtained when 8V.-5W. and 8V.-13+3.5W. (D.F.) Lamps are used in the Optical Combination equipped with a 30° Spreadlight Cover Glass, as in Fig. 28.

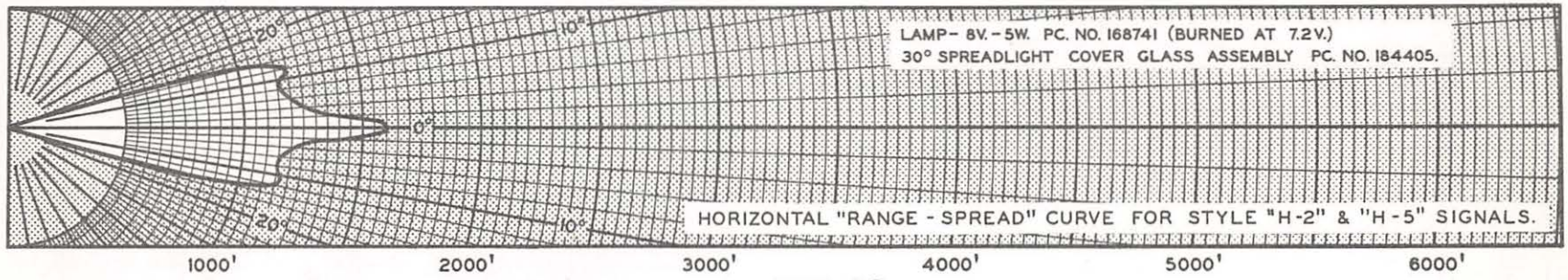


FIG. 29

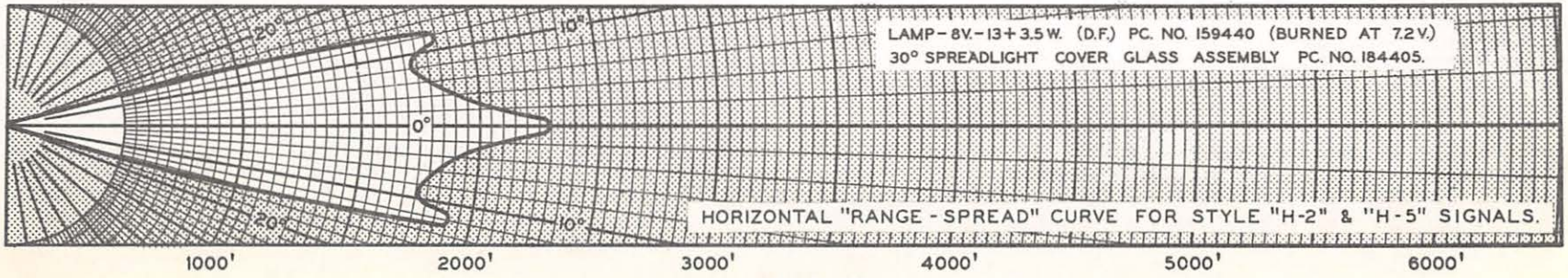


FIG. 30

Range Compensation for Changes in Lamp Voltage

The percentage of increase in range of the Searchlight Signal plotted against percentage increase in voltage is shown in Fig. 31. The rated voltage is that at which a lamp will have an average life of 1,000 hours, except in the case of the 11-volt, 11-watt lamp which would be rated at 11.7 V. for 1,000 hours life. At recommended voltage, or 90 percent of the 1,000 hr. voltage, the lamps will have an average life of 4,000 hours (see Instruction Pamphlet U-5037 for life at any other voltage). All range curves in this bulletin are based on the lamps burning at recommended voltage, and the range at that voltage is taken as 100 percent. By the use of curve, Fig. 31, any of the range curves can be corrected for any desired lamp voltage.

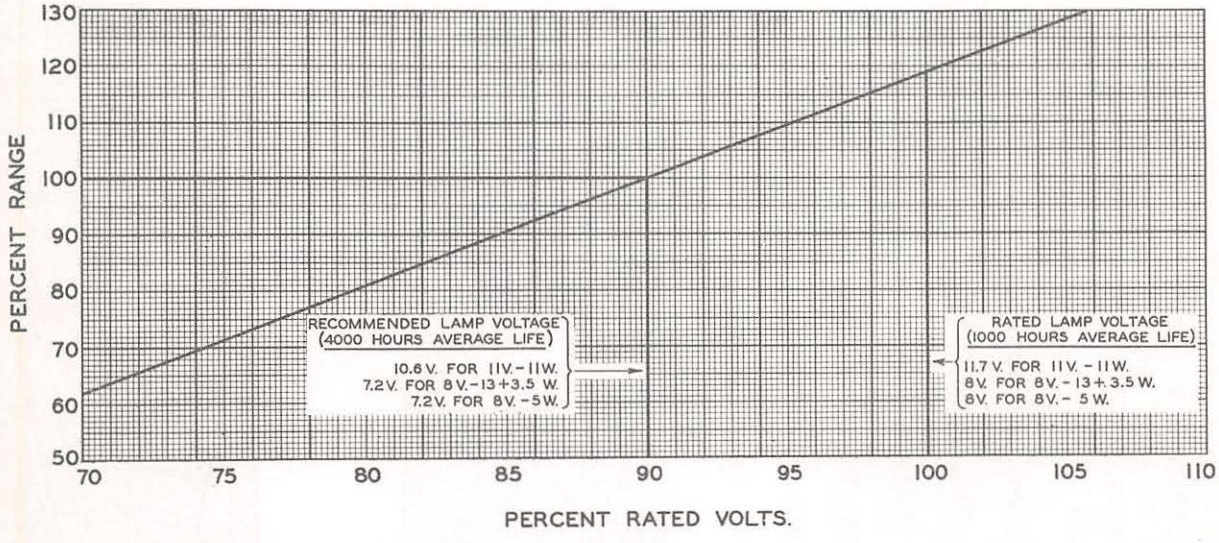


Fig. 31....Curve showing how to correct "Range-Spread" Curves when Lamps are burned at other than recommended voltages.

Ordering Instructions:

When ordering completely assembled Style "H", "H-2", and "H-5" Signals from Catalog Plates B-2865 to 2900, it will be noted that certain additional information covering lamp voltage, type of lamp and deflecting cover glasses (if any) must be specified. In a majority of cases, this information may be found in the foregoing graphs and descriptions and the anticipated results may be visualized. To illustrate: Suppose a "Range-Spread" Curve (Figs. 7 to 30) is found which satisfies the conditions of the desired signal location with reference to track alignment, and involves a lamp voltage which is available at the location. The notes on the "Range-Spread" Curve specify the ordering references for parts of the "Optical System", other than what is standard for all signals of the type. Unless otherwise specified, flat 10° and 20° deflecting and the 30° spreadlight cover glasses, together with their inclined adapter rings, will be substituted in place of the convex type as shown in Ref. 38, catalog Plate B-2881. The ordering references for these lenses are listed below:

10° Deflecting Cover Glass assembled in inclined adapter ring.....Pc.#184403

20° Deflecting Cover Glass assembled in inclined adapter ring.....Pc.#184404

30° Spreadlight Cover Glass assembled in inclined adapter ring.....Pc.#184405

(Note) In the first two assemblies, the deflecting cover glasses are mounted in the adapter ring so as to spread the beam to the left (facing the signal), as shown on the various curves. By loosening the retaining screws, the glass may be rotated 180° in the adapter for deflection to the right. This change can be made

on the road or the units will be assembled to suit the condition if specified in the order.

10° Deflecting Cover Glass only.....Pc.#182864

20° Deflecting Cover Glass only.....Pc.#182473

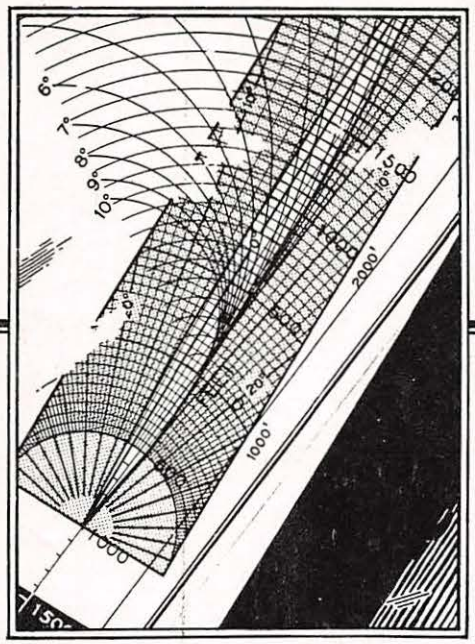
30° Spreadlight Cover Glass only (15° each side of axis).....Pc.#184406

The ordering reference for the later type lens hood which is longer but interchangeable with Ref. 9, Plate B-2880 is:

Lens Hood.....Pc.#184414

General Sales Manager

H. Young



Styles "H" and "H-2" *SEARCHLIGHT SIGNALS*

ENGINEERING DATA

for determining

Beam Spread and Range—Proper Use of Various Deflecting Cover Glasses—Proper Location of Signals on Curves—Correct Voltage for Lamp Operation,

Including the use of the new ORIENTING GRAPH

U.D. 200

Copyright, 1933

Union Switch & Signal Co.
SWISSVALE, PA.

1250

Union Switch & Signal Co.

EPC
Outline UD 200

COPY FOR Mr. P. P. Willard
For your information

Union Searchlight Signals

Swissvale, Pa., October 15, 1941

Chicago Office:

We have noted your two letters of October 8 and one letter of October 9 on the above subject and wish to reply as follows:

1. In lieu of photographs or drawings showing the inclined flat deflecting cover glass assembly, with or without phankill, we would refer you to the September 1941 issue of Instruction Pamphlet U-5034, Figs. 7, 7-A and 8, two copies of this latest issue of the instruction pamphlet being attached herewith for your information. Fig. 7 illustrates the flat type of deflecting cover glass that has been used for a number of years and Fig. 7A shows its assembly. Figure 8 shows this assembly when Phankill is included and the discussion therewith appears in the last paragraph on Page 11 and in the middle of Page 15. The assembly illustrated by Fig. 7A has always been part of U.D. 200, Figs. 2 and 5.

2. Mr. Fisher told Mr. Harloff by telephone on October 9 that reference could be made to U.D. 200 for the inclined flat glass assembly without Phankill as representing our recommended and standard practice.

3. In all cases for dwarf signals or high signals, the Phankill unit is not being furnished as standard but only when ordered and at an additional cost of $10.00 per unit. This was covered by our circular letter of September 24, 1941 to all district offices, transmitted with our (LCR) letter of October 2, 1941 under the subject "Searchlight Signals - Revisions to Correct the Effects of External Reflected Light."

4. The Chicago Office memorandum dated October 8 concerning Union searchlight signals, copy of which was attached to one of your October 8 letters, is

incorrect in many respects. We submit herewith the following which should be used instead:

1st - Searchlight dwarf signals. All such signals will be equipped with an inclined flat deflecting cover glass for deflecting the light upward instead of the convex type heretofore furnished. The standard close-up prism in back of the main lens will not be changed. No Phankill unit will be furnished unless ordered by the railroad at the additional cost of $10.00 per signal.

2d - Searchlight high signals. All of these signals will be furnished without deflecting prism for curves or Phankill unit, but with close-up prism. Whenever a railroad company orders searchlight high signals with spreadlight feature for use at curves, we equip them with an inclined flat deflecting cover glass per Figs. 2 and 5 of U.D. 200. The inclined flat deflecting cover glass will be selected as discussed in U.D. 200, the degree of deflection depending upon the track curvature. No Phankill unit will be furnished unless ordered by the railroad at the additional cost of $10.00 per signal.

3d - Phankill unit when supplied for dwarf or high signals will be as shown in "B", Fig. 8, U-3034 (September 1941).

For your information, a copy of Instruction Pamphlet U-3034, referred to in the discussion above, is shipped to our customers with all orders for Styles "H" and "H-2" signals. A similar pamphlet is also shipped with orders for "H-5" signals.

(Signed) C. R. Beall

AWF:FF

cc-PDM CWB PFW ACK HSB WBW

U.D. ~~S.F.S.~~ 200

Memorandum Regarding Searchlight Signals and the Superseding of Style H by Style H-2.

1. The style H signal under discussion is shown in Catalog Plate B-2880 and U.D. 151 and 200.

The style H-2 signal is shown in catalog Plate B-2881 and in U.D. 151 and 200.

2. The essential difference in the two signals is in the lens assembly and the upperhalf of the operating unit.

(a) The H signal has a single lens, stepped (Fresnel type) with a close-up prism section moulded into the center of the lens. The operating unit has glass windows only and no lens.

(b) The H-2 signal has a doublet lens combination and the lenses are of the plano-convex type, considerably more efficient than the stepped, single lens. The close-up indication is by means of a separate prism mounted behind the outer lens and accessible for adjustment by means of a convenient hand hole. The inner lens of the doublet is mounted in the operating unit.

3. The increased efficiency of the Style H-2 signal makes it adaptable to primary battery service with 5 watt or 3 watt lamps. If used with the higher wattage lamps that have been popular with the Style H signal, a much stronger beam and longer range is obtained than with the H signal, or the same intensity and range is possible by burning the lamps at reduced voltage. This means considerably longer average lamp life and less lamp failures per year.

4. Comparing the two signals further on the basis of using the same lamps, there is no sacrifice of spread. Narrow beam spread is evident only with the extremely small 3 watt and 5 watt filaments, but even here the spread is sufficient for most practical applica-

tions and is easily increased where needed by standard prisms.

The actual story of spread and range is illustrated clearly in U.D. 200 by referring to Figures 10 and 14, 16 and 26, 20 and 28 where complete curves are shown for the H and H-2 using the standard lenses, as well as the 10° and 20° prisms, all with an 8 volt 13 plus 3.5 watt lamp. The results with other lamps are also shown in this U.D.

5. Fading of the red indication due to bright sunlight shining into the signal is not as probable on the H-2 as on the H, on account of the greater intensity of the signal beam.

6. The advantages to the R.R., through the use of the H-2 are so obvious that they would appear to more than compensate for the one disadvantage of having two types on the road.

7. The advantages from a manufacturing standpoint are in the ability to concentrate production on one type, thereby [redacted] having stock always available.

8. In view of 6 and 7 above, steps were taken sometime ago to discontinue quantity production on details for the Style H signal. The stock of parts are now used up and we should, if at all possible, ship Style H-2 only in the future. Most of our customers have issued instructions to us to this effect on their own initiative and it would be highly desirable to have such instructions from all concerned.

9. Customers requiring searchlight signal for the first time would be furnished the H-2 without question.

Swissvale, Pa., July 2, 1935

1250

Union Switch & Signal Co.

C.W.B. Price estimates 6/23

File with U.D. 200

COPY FOR MR. H. [illegible] LOOMIS:

The contents of this letter will be interesting data for your dept. We are asking Mr. Beakes to place it in form for issuing as a confidential supplement to our U.D.#200.

A.W.F.

C. & O. Railway
Light Signals
3-Watt Lamps

Better attach our notice re 3 watt lamps 6/23

Swissvale, Pa.,
June 22, 1933

NEW YORK OFFICE:

This refers to letter of May 12, 1933, File 256-1, from C. A. Taylor, Supt. T. & S., C. & O. Railway, endorsed to us by "HWG" on May 17, 1933, and your "hwg" letter of June 12, with reference to the possible use of 4 volt 3 watt lamps in searchlight signals by the C. & O.

COPY

The question raised by Mr. Taylor as to whether or not the 4 volt 3 watt lamp could consistently be considered for use in curved track territory such as exists on the greater portion of the C. & O. system, resolves itself very largely into what he may consider a satisfactory range of indication under various conditions. With this point in view, we have prepared and transmit, herewith, three "Range Spread" Curves, designated supplements numbers 3, 4, and 5 of U. D. #200, showing "Range" obtained in the H-2 searchlight signal with a 4 volt 3 watt lamp operated at 4 volts, (i.e. on a 1000 hr. average life basis), without cover glass, with a 10 deg. deflecting cover glass, and with a 20 deg. deflecting cover glass, respectively. You will note the maximum range obtained in each case is 4750 ft., 2300 ft. and 1550 ft.

From curve sheets figures 3, 25 and 27 of U.D. #200, it will be noted that ranges of 5350 ft. 2950 ft. and 2000 ft. are

obtained with the same optical equipment, with the 8 volt 5 watt lamp operated at 7.2 volts, i.e. on a 4000 hour average life basis. The ratios in ranges, therefore, are as follows, in favor of the 8 volt 5 watt lamp:

$\frac{5350}{4750} = 1.125$ or 12.5% better range without cover glass.

$\frac{2950}{2300} = 1.285$ or 28.5% better range with 10 deg. deflecting cover glass

$\frac{2000}{1550} = 1.29$ or 29% better range with 30 deg. cover glass.

While this information is of value as comparative data, practically, local conditions and individual opinions are very important in considerations of this kind. For instance, a 29% improvement in range may be considered very desirable, but the approach view of a signal across a curve is very often obstructed by buildings, trees, or embankments, and as a result the full possible range of the signal cannot be utilized. It is, of course, true that the longer range signal will provide a more intense indication at a fixed distance from the signal. In view of these considerations, we would like to send samples of the 4 volt 3 watt lamp to Mr. Taylor, so that he may make actual comparisons with the 8 volt 5 watt lamp in the field, as a means of forming or confirming his own opinions as to the indications from the H-2 signals.

The following additional information may be of interest to Mr. Taylor in connection with consideration of this subject:

It will be noted that it is recommended that the 4 volt 3 watt lamp be operated at 4 volts, that is on a 1000 hour average life basis. If this lamp is operated at 90% rated volts, i.e. 3.6 volts, the maximum ranges corresponding to conditions for curve

sheets, supplements numbers 3, 4, and 5 of U.D.#200, will theoretically be about 4000 ft. , 1800 ft. and 1250 ft. respectively

Operation of lamps on the 1000 Hour average life basis instead of the 4000 hour average life basis, and replacing lamps at 30% of average life to secure 5% failure performance in each case, requires four times as many of the 4 volt lamps, and results in four times as many lamp failures.

Where lamps are normally operated at 90% rated volts, as is practicable with the 8 volt 5 watt lamp, the voltage can consistently be increased on signals equipped with deflecting cover glasses to equalize the intensity of indications, while on the 4 volt 3 watt lamp normally operated at rated voltage, the voltage cannot be consistently increased for this purpose.

With the 4 volt 3 watt lamp operated at rated volts and the 8 volt 5 watt lamp operated at 90% volts normally, the additional wattage per lamp for the 8 volt 5 watt lamp is about 1-1/4 watts.

The use of a ballast tube voltage regulator, which has been developed by the Edison Primary Battery Company, for the 4 volt 3 watt lamp operated from primary battery can be recommended in place of the floating storage battery regulation originally thought to be necessary. This will practically eliminate one important objection previously held for the separate lighting battery scheme.

(Signed) L. Frederic Howard

By C. R. Beall

TJO/RP

cc-HSLoomis, HSBeakes

Form 2127

Union Switch & Signal Co.

SWISSVALE, PA.

Subject: PLUG-IN CONNECTOR FOR "H" AND "H-2" TYPE SEARCHLIGHT SIGNALS.	Union Development
See UD-200 for general information concerning Styles "H" and "H-2" Searchlight Signals.	Number: 200, Supplement A
	Date: May 22, 1939
	3 Sheets

One of the features of the Style H-5 Searchlight Signal described in U.D. 237 is the use of plug-in connectors which permit quick removal and replacement of operating units without disconnecting any of the field wires. This feature may now be had in the Style "H" and "H-2" signals or may readily be applied to these signals in service. This plug connector consists of a molded bakelite terminal board equipped with terminal posts spaced and marked the same as the terminals on the regular operating unit terminal posts. Housed inside the bakelite body, are spring clip connectors which slide over and make contact with the terminal posts on the operating unit.

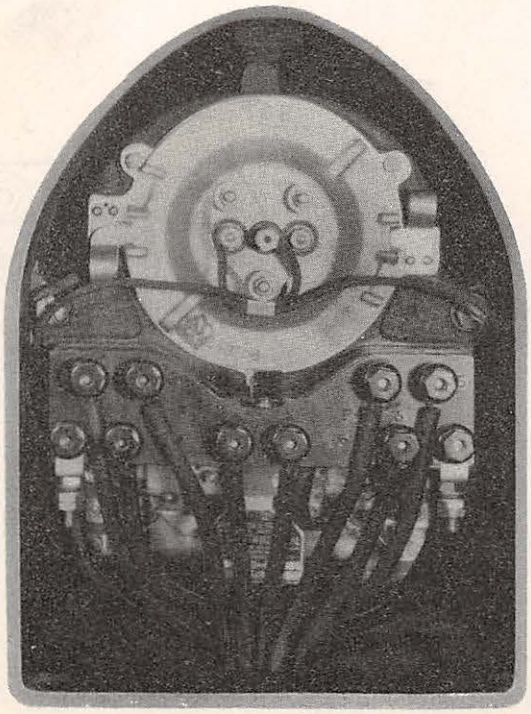


Fig. A1...Plug-In terminal board applied to "H-2" Searchlight Signal.

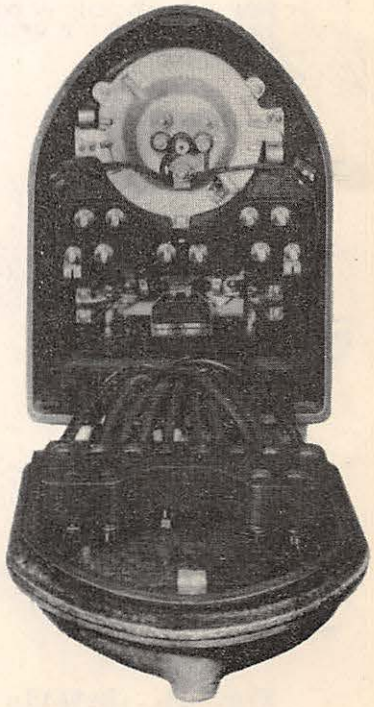
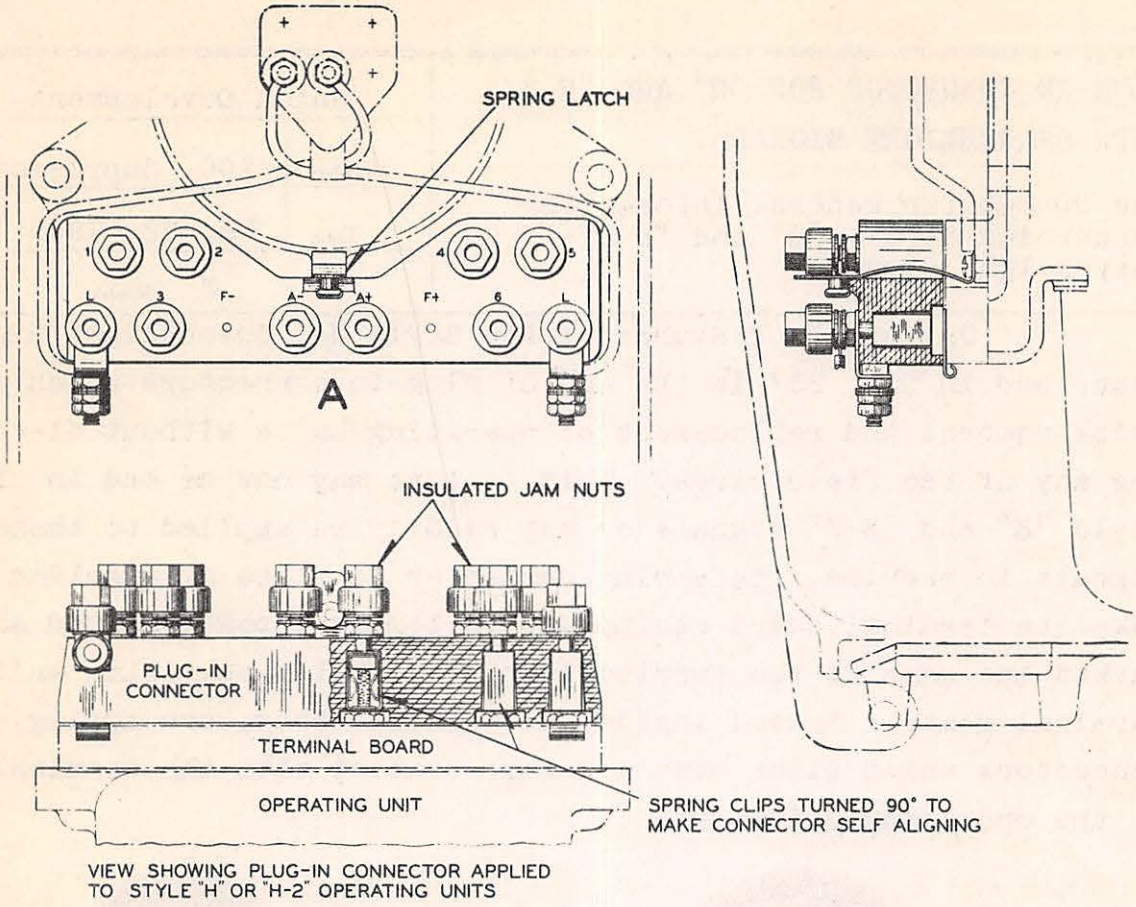


Fig. A2...Operating unit easily removed without disconnecting wiring.


SPRING LATCH
A
INSULATED JAM NUTS
PLUG-IN CONNECTOR
TERMINAL BOARD
OPERATING UNIT
SPRING CLIPS TURNED 90° TO MAKE CONNECTOR SELF ALIGNING
VIEW SHOWING PLUG-IN CONNECTOR APPLIED TO STYLE "H" OR "H-2" OPERATING UNITS

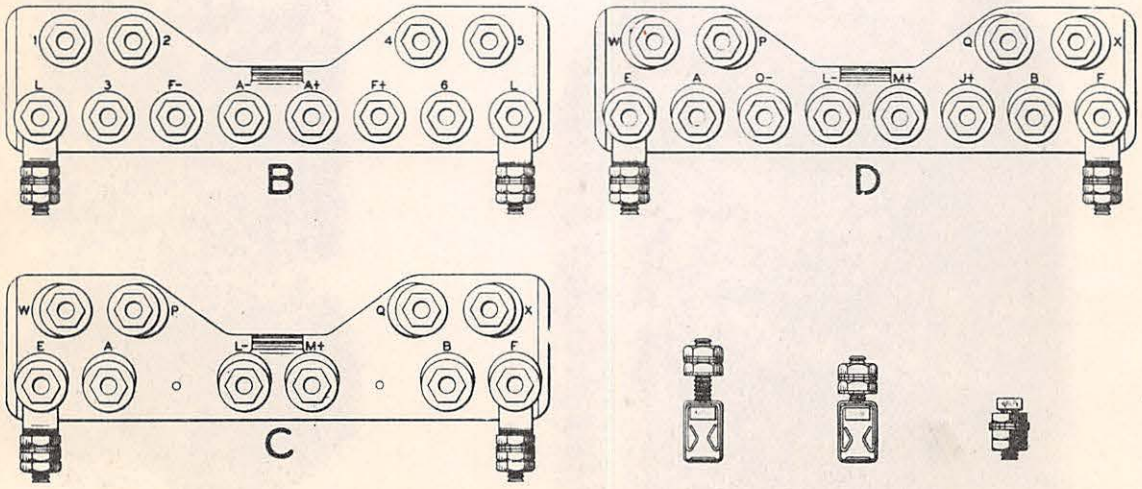


Fig. A3...Details and application of "Plug-In Connector" for Styles "H" and "H-2" Searchlight Signals.

Some of the advantages of this device are:

1. Materially shortens the time required to remove from service and replace operating units, thus eliminating or shortening train delay time, especially in congested territories.
2. Eliminates any possibility of replacing field wires on the wrong terminals when changing units, as wires are not removed from the plug connector.
3. Can be applied to signals now in service without making any change in the operating units. Wires are simply transferred from the existing terminal posts to similarly marked posts on the plug connector.
4. Plug connector spring clips are designed to provide ample contact pressure and to have a wiping action on the terminal screws when the connector is plugged onto the operating unit.
5. Plug connector board is made self-aligning by turning several of the spring clips 90 degrees with respect to the rest of the clips when assembling. (See Fig.A3). Uniform contact is made on all posts.
6. The plug connector is held in place by a springlock which is latched and unlatched without the aid of tools.
7. Terminal binding posts on the plug connector are equipped with special insulated jam nuts which eliminate any possibility of their being grounded or short-circuited when the connector is removed from the operating unit.

INSTALLATION

When plug-in connectors are ordered for application to operating units already in service, complete instructions for installing them are furnished with each order.

ORDERING REFERENCES

Until such time as the "Plug-In Connector" for Style "H" and "H-2" Searchlight Signals is properly cataloged, it is suggested that orders specify reference A, B, C or D of Fig. A3, whichever agrees in terminal nomenclature with the particular Railroad Standard.

W. H. Cadwallader

Vice Pres. & Gen'l Mgr. 5/24/39